



Sleep, pain and exercise: An integrative perspective on neuroscience education



Comments on article titled “Exercise therapy for chronic musculoskeletal pain: Innovation by altering pain memories”

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We would like to congratulate [Nijs et al. \(2014\)](#) for their study, which comprehensively described cognition-targeted motor control exercise therapy using therapeutic pain neuroscience education. It suggested that musculoskeletal pain be considered from a broader perspective and include subjective characteristics of pain such as the affective-motivational aspects, childhood experience of pain and pain emotions.

One of the most challenging factors for musculoskeletal therapists and health professionals is to deal with pain memories. This outstanding recent article by [Nijs et al. \(2014\)](#) in *Manual Therapy* is timely and their proposals should be strictly followed by musculoskeletal therapists in order to provide educative and comprehensive care (pain neuroscience education) in clinical practice to chronic musculoskeletal pain patients.

We would like to highlight the intrinsic relationship between pain and sleep (quality, quantity and efficiency) and how sleep has been shown to have a role in memory consolidation (off-line learning) in relation to motor skills learning, which is of particular relevance to the [Nijs](#) article. There is evidence of an improvement in motor skills learning when the “off-line” period, i.e. the period between learning and assessing any improvement in skills, includes a period of sleep ([Walker et al., 2002](#)).

In addition, longitudinal studies have demonstrated that sleep disturbances, such as long term sleep fragmentation double the risk of developing musculoskeletal pain ([Mork and Nilsen, 2012](#); [Nitter et al., 2012](#)). Moreover, duration of sleep (<6 h or >9 h) increases the frequency of next day pain report ([Edwards et al., 2008](#)).

Pain (and sleep disturbances) may produce or maintain cognitive, affective and motivational dysfunctions, which in turn can lead to hypervigilance and awakenings. Pain memory can alter sleep duration ([Sutton and Opp, 2014](#)) and also affect sleep quality, even without cognitive arousal (e.g. patient feeling pain in a specific position during the night).

It is clear that the relationship between pain and sleep are well established ([Finan et al., 2013](#)) and the adoption of quite simple

measures, such as sleep hygiene could help promote restorative sleep ([Stepanski and Wyatt, 2003](#)).

The use of exercise as a tool to change pain memories should reflect on sleep and its memory consolidation. An integrative approach for the treatment of pain through exercise therapy targeting pain memories is very important, and should consider the relationship between pain and sleep, to help improve clinical situations in which these two factors play a part.

Conflict of interest

The authors declare no conflict of interest.

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